

Remarks on the taxonomy of
Sudanonautes chavanesii (A. Milne-Edwards, 1886)
(Brachyura: Potamoidea: Potamonautidae)
from Central Africa

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Abstract.—The fresh-water crab *Sudanonautes chavanesii* (A. Milne-Edwards, 1886) is redescribed from new material which is compared to previous descriptions of the male type from Gabon. The gonopods and mandibles of a male from Cameroon are described and illustrated for the first time. New records of specimens from several museum collections are presented. The species is recognized by a combination of characters of the carapace, chelipeds, mandibles, and gonopod 1. The range of *S. chavanesii* has been found to be restricted to an area from south Cameroon to Gabon; the species does not occur in West Africa (from Senegal to Nigeria), as previously thought.

Sudanonautes chavanesii (A. Milne-Edwards, 1886), a fresh-water crab from Central Africa, has been recognized as a valid species by a number of authors (A. Milne-Edwards 1887, Rathbun 1905, Balss 1929, Chace 1942, Capart 1954). However, more recent authors (Bott 1955, 1959; Monod 1977) have considered this taxon to be a subspecies of *Sudanonautes* (*Sudanonautes*) *africanus* (A. Milne-Edwards, 1869). Data presented here indicate that *S. chavanesii* is indeed a valid species. Furthermore, no characters were found to support the inclusion of *S. chavanesii* in any subgenus, as has been suggested by other workers (*Parathelphusa* H. Milne-Edwards, 1854 (A. Milne-Edwards 1887, Rathbun 1905), *Potamonautes* MacLeay, 1838 (Ortmann 1897), or *Sudanonautes* Bott, 1955 (Bott 1955, 1959; Monod 1977, 1980)).

Bott's (1955) description of *S.* (*S.*) *africanus chavanesii* consisted of a one-line diagnosis apparently made without reference to type material, and gonopod 1 was not described. Published figures of gonopod 1 of the type specimen of this species (Capart 1954) indicate a short, straight terminal seg-

ment. A series of adult males from Cameroon examined in the present study indicate a different structure for gonopod 1: the terminal segment is long, slim, and curves outward. It is likely that gonopod 1 of the type specimen from Gabon is unusual. Findings are presented here based upon the structure of the entire adult male gonopods of *S. chavanesii* from Cameroon, together with other characters of the mandibles, carapace and chelipeds.

Four dimensions of the carapace were recorded using digital calipers as follows: carapace length (CL) measured along median line, carapace width (CW) at widest point, measured beneath the large tooth on the anterolateral margin, carapace height (CH) maximum height of cephalothorax, and front width (FW) width of front measured along anterior margin. Carapace proportions were calculated according to carapace length. These data were pooled and used for descriptions of growth. Statistical comparisons between species were made between sexually mature adults only. The distribution of *S. chavanesii* described here is based on data from direct examination of speci-

mens, since literature records are not reliable. The following abbreviations are used: MNHN = Muséum national d'Histoire naturelle, Paris; USNM = National Museum of National History, Smithsonian Institution, Washington, DC, U.S.A.; NHM = Natural History Museum, London, U.K.; RCM = Royal Congo Museum, Tervuren, Belgium; IFAN = Institut Fondamental d'Afrique Noire, Dakar, Senegal; NMU = Northern Michigan University, U.S.A., δ = male, ♀ = female.

Sudanonautes chavanesii

(A. Milne-Edwards, 1886)

(Figs. 1–3)

Thelphusa chavanesii A. Milne-Edwards, 1886:150.

Parathelphusa chavanesii.—A. Milne-Edwards, 1887:145–146, pl. 7, fig. 3a, b.—Rathbun, 1900:285.

Potamon (Potamonautes) chavanesi.—Ortmann, 1897:305, 309.

Potamon (Parathelphusa) chavanesii.—Rathbun, 1905:232, pl. 11, fig. 1.—Balss, 1929:127.—Balss, 1936:166.

Potamon chavanesi.—Chace, 1942:209.—Capart, 1954:829–830, figs. 7, 11.

Sudanonautes (Sudanonautes) africanus chavanesii.—Bott, 1955:299, fig. 97.—Bott, 1959:1005.—Monod, 1977:1217 (not figs. 103–107).—Monod, 1980:384.

Material.—Gabon: Adult δ , type (CW 54, CL 39 mm), MNHN B5079, vicinity of Franceville, on the river Alima, Mission de Brazza. Adult δ (CW 54 mm) cotype, USNM 30034, La de Franceville, Mission de Brazza. Cameroon: One ♀ , MNHN B5081, Ohana, Besa, Nyong. One δ (CW 46 mm), MNHN B5077, Mt. M. Banbarto, river Noun. One δ , NHM 1936.2.27.1–3, Batouri District. Two specimens, (RCM) 51.554, 1 ♀ mature (CW 70 mm), 1 δ (CW 48 mm), Soari, 26 Sep 1964, Thijs van den Audenaerde. RCM 53.282, 1 δ (CW 43 mm), Belabo, 16 May 1970, Thijs van den Audenaerde. RCM 53.290, 1 ♀ adult, Ebogo, 24 May 1970, Thijs van den Audenaerde. Three

adult δ (CW 72.7, 69.6, 59.1 mm), RCM 53.291, Ebogo, 21 May 1970, Thijs van den Audenaerde.

Type locality.—Vicinity of Franceville, on the river Alima, Gabon.

Diagnosis.—Epibranchial tooth large, pointed outward, set back behind mid-point of postfrontal crest, positioned in line with widest point of carapace; distance between epibranchial tooth and intermediate tooth twice the distance between intermediate and exo-orbital teeth. Postfrontal crest spanning entire carapace, crest curving sharply backward before meeting epibranchial tooth; distinct notch in crest behind exo-orbital tooth; anterolateral margin smooth posterior to epibranchial tooth. Semi-circular, urogastric, cardiac, transverse branchial grooves very deep. Exo-orbital, intermediate teeth large, sharp, pointed forward; epibranchial tooth large, pointed outward. Vertical suture on flank forming y-shaped depression beneath intermediate tooth (Fig. 2b). Carapace very flat (CH/CL = 0.41). Mandibular palp 2-segmented; terminal segment single, undivided, with small hard, hair-fringed flap at junction between segments (Fig. 2a–b). Terminal segment of gonopod 1 thin and needle-like, subterminal segment gonopod 1 slim (Fig. 2d–f). Dactylus of major cheliped arched, forming oval interspace when closed; 2–3 large fused teeth in proximal regions of both fingers of the cheliped, rest of cutting edges lined with rows of rounded teeth (Fig. 1e–f).

Redescription.—Carapace (Fig. 1a, b) ovoid, widest in anterior third (CW/CL 1.37), very flat (CH/CL 0.42), semi-circular; urogastric, cardiac, transverse branchial grooves very deep, regions covered with raised circular blisters; cervical grooves present but weak. Branchial regions of carapace with fields of faint raised short lines. Front deeply bilobed, anterior margin indented, curving down, relatively narrow, less than $\frac{1}{3}$ carapace width (FW/CW = 0.30). Postfrontal crest smooth, spanning entire carapace, straight part consisting of fused epigastric, postorbital crests, then curving

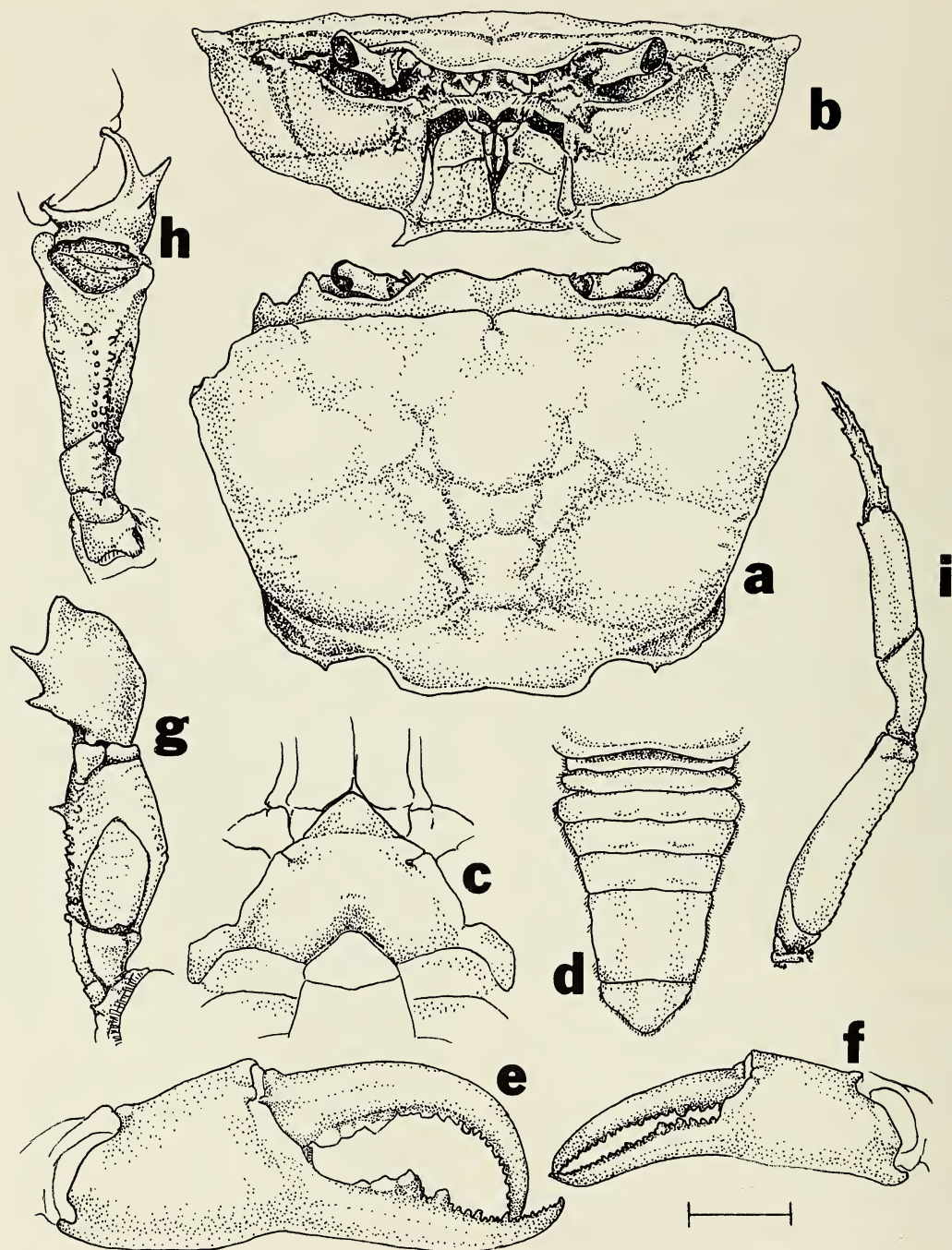


Fig. 1. *Sudanonautes chavanesii* (A. Milne-Edwards, 1886), adult male (CW 72.7 mm) from Ebogo, Cameroon (RCM 53.291). a, carapace, dorsal aspect (left epibranchial tooth broken); b, carapace, frontal aspect; c, sternum; d, abdomen; e, right cheliped, frontal view; f, left cheliped, frontal view; g, carpus, and merus of right cheliped, superior view; h, carpus, and merus of right cheliped, ventral view; i, left periopod 2. Scale bar equals 20 mm (a-d), and 16 mm (e-i).

sharply backward behind intermediate teeth to meet anterolateral margins at the epibranchial teeth. Distinct notches in crest behind exo-orbital teeth; anterolateral margin smooth posterior to epibranchial tooth. Exo-orbital, intermediate teeth large, sharp, pointed forward. Epibranchial tooth large, pointed outward, set back behind mid-point of postfrontal crest, positioned in line with widest point of carapace; distance between epibranchial tooth and intermediate tooth twice the distance between intermediate and exo-orbital teeth.

Flanks mostly smooth, with faint granules in suborbital regions. Each flank with 2 sutures, 1 longitudinal, 1 vertical, dividing flank into 3 parts (Fig. 1b). Longitudinal suture dividing suborbital, subhepatic regions from pterygostomial region, beginning medially at lower margin of orbit, curving backward across flank. Short vertical suture beneath intermediate tooth dividing suborbital region from subhepatic region, suture forming y-shaped depression beneath intermediate tooth (Fig. 1b); stem of y-shape meeting longitudinal suture. First transverse groove on sternum (between sternal segments 2 and 3) complete; second groove (between sternal segments 3 and 4) consisting of 2 small notches at sides of sternum (Fig. 1c). Third maxillipeds filling entire oral field, except for transversely oval efferent respiratory openings at superior lateral corners; long flagellum on exopod of third maxilliped (Fig. 2c); ishium of third maxilliped smooth, with clear vertical groove (Fig. 2c). Mandibular palp 2-segmented; terminal segment single, undivided, with small hard, hair-fringed flap at junction between segments (Fig. 2a–b). Segments 1–6 of abdomen four sided, last segment triangular, sides indented, rounded at distal margin (Fig. 1d); segment 3 broadest, segments 4–7 tapering inwards (Fig. 1d).

Chelipeds (Fig. 1e–h) unequal, right longer, higher than left. Dactylus of right cheliped long, arched; palm of propodus swollen; proximal region of fingers of digits of

right cheliped each with 2–3 large fused teeth, forming oval interspace when closed; rest of cutting edges of fingers lined with smaller cheliped small to very small, fingers forming narrow interspace when shut. Inferior margins of merus with rows of small teeth, cluster of granules surrounding larger pointed tooth at distal end. Inner margin of carpus of cheliped with 2 large, slender, pointed teeth, second half size of first (Fig. 1g–h). Dactylus of left cheliped not arched, otherwise similar to right, but smaller in all respects (Fig. 1f). Walking legs 2–5 (pereiopods = P) slender (Fig. 1i), P4 longest, P5 shortest. Posterior margin of propodus of P2–5 smooth or slightly serrated, dactyli of P2–5 tapering to point, each bearing 4 rows of downward-pointing sharp bristles; dactylus of P5 shortest of the 4 legs (Fig. 1i).

Gonopod 1 with very slender terminal segment, long ($\frac{1}{3}$ as long as penultimate segment), curving strongly outward along entire length, tapering to pointed tip, longitudinal groove visible from caudal and superior views (Fig. 2d–e), not visible from cephalic view (Fig. 2f). Subterminal segment of gonopod 1 very slim (Fig. 2d, f), with raised flap extending halfway across segment, forming roof of chamber for gonopod 2; subterminal segment beneath flap forming lower floor of chamber for gonopod 2 (Fig. 2f). Gonopod 2 (Fig. 2g) shorter than gonopod 1 (reaching only to junction between last 2 segments of gonopod 1). Terminal segment of gonopod 2 extremely short, only $\frac{1}{15}$ as long as subterminal segment, sides folded inwards to form spoon-shape, tip rounded. Subterminal segment gonopod 2 widest at base, then tapering sharply inward, forming long, thin, pointed, upright process which supports short terminal segment; rounded collar at junction between terminal segment and subterminal segment.

Adult female.—Chelipeds same proportions as male of same size, right cheliped enlarged, measuring longer and higher than the left cheliped. Mature female abdomen very wide reaching coxae of pereiopods 2–

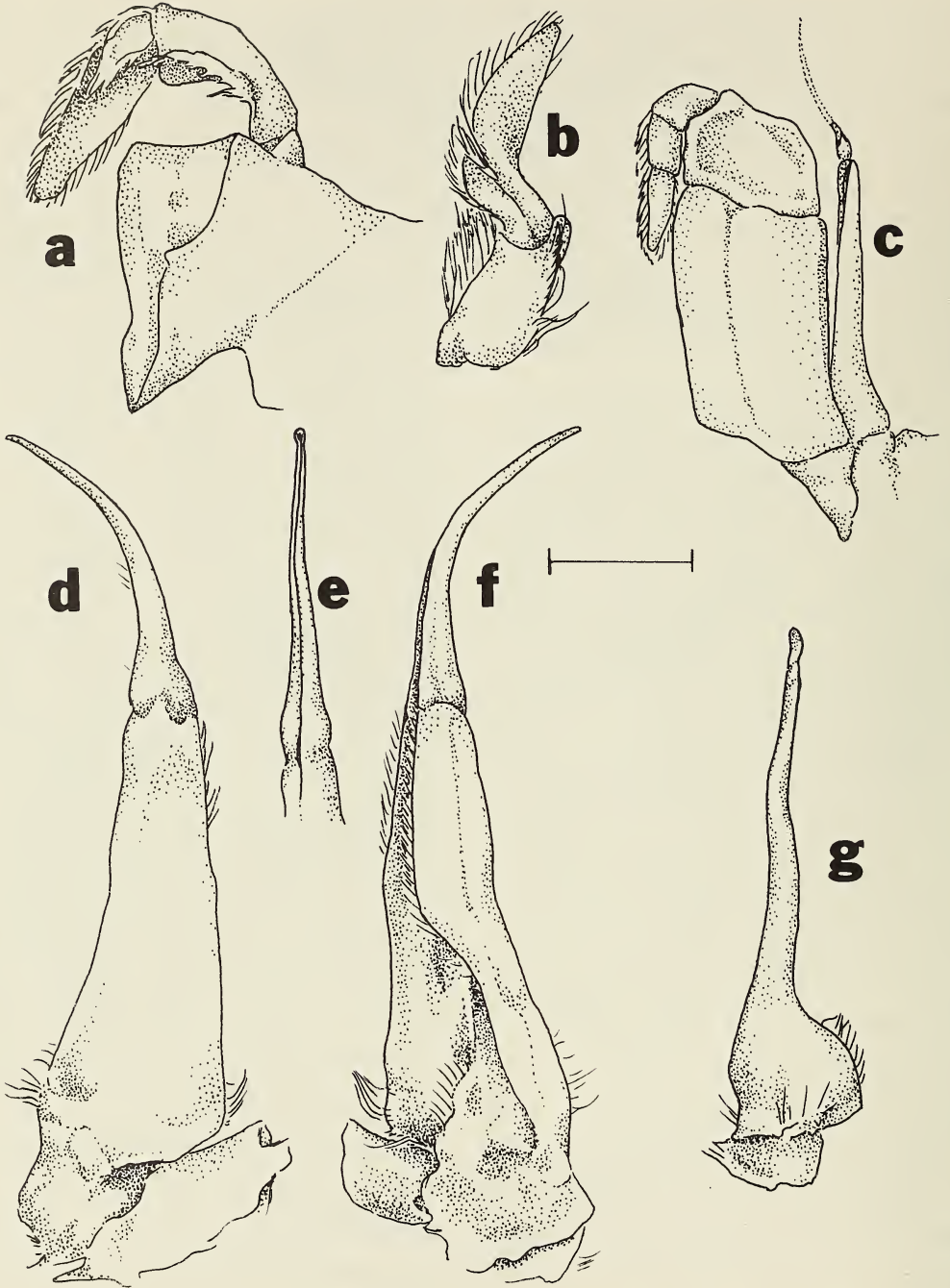


Fig. 2. *Sudanonautes chavanesii* (A. Milne-Edwards, 1886), adult male (CW 72.7 mm) from Ebogo, Cameroon (RCM 53.291). a, left mandible, anterior view; b, left mandible superior view; c, left third maxilliped (flagellum broken in this specimen); d, left gonopod 1, caudal view; e, terminal segment of left gonopod 1, superior view; f, left gonopod 1, cephalic view; g, left gonopod 2, caudal view. Scale bar equals 3 mm (a, b, d, e, f, g), and 7 mm (c).

5. Segments of female abdomen rectangular, wider than long, distal segments longest and widest; abdomen widest at groove separating segments 4, 5; segment 6, telson together forming near semicircle.

Growth (Fig. 3a, b).—Sexual maturity judged by development of female abdomen: abdomen of mature females overlapping bases of coxae of walking legs, pleopods broad, hair-fringed. Pubertal molt, from pubertal stage to sexual maturity, occurring between CW 35–45 mm. Largest known specimen (male from Cameroon) CW 81 mm. Dimensions of carapace varying with age (Fig. 3a). Relative width of carapace (CW/CL), relative height of carapace (CH/CL), and relative width of the frontal margin (FW/CL) not changing with age: proportions of adults remaining constant with age; proportions of adults not significantly different ($P > 0.05$) from those of juvenile and pubescent animals (Fig. 3b). Right and left chelipeds of juveniles (CW < 35 mm) even sized, palms not inflated, cutting edges leaving no gap when closed.

Distribution.—Coastal rain forest from south Cameroon to Gabon. It is likely that *S. chavanesii* is also present in Equatorial Guinea. Bott (1955) reported *S. chavanesii* from a wider region of Central Africa (from Cameroon to Zaire). However, there are no confirmed records of this species in the Central African Republic, the Republic of the Congo, or in Zaire. Bott (1959) and Monod (1977, 1980) extended the range of *S. chavanesii* further to include West Africa, from Guinea all the way to Zaire. However, there is reason to doubt these records. Bott (1959) reported *S. chavanesii* from Guinea and Mali. Monod (1977) illustrated these same specimens, from ravin de Sokonafing, near Bamako, Mali (Monod 1977, figs. 103, 104, 106, 107), and from Fenaria, Guinea (Monod 1977, fig. 105). This same material, deposited in IFAN, from Dabola, chutes de Tinkasso, Guinea (Kindia, 5 Apr 1954, A. Villiers), and from Mali (Ravin de Sokonafing, Bamako, May 1945), were all iden-

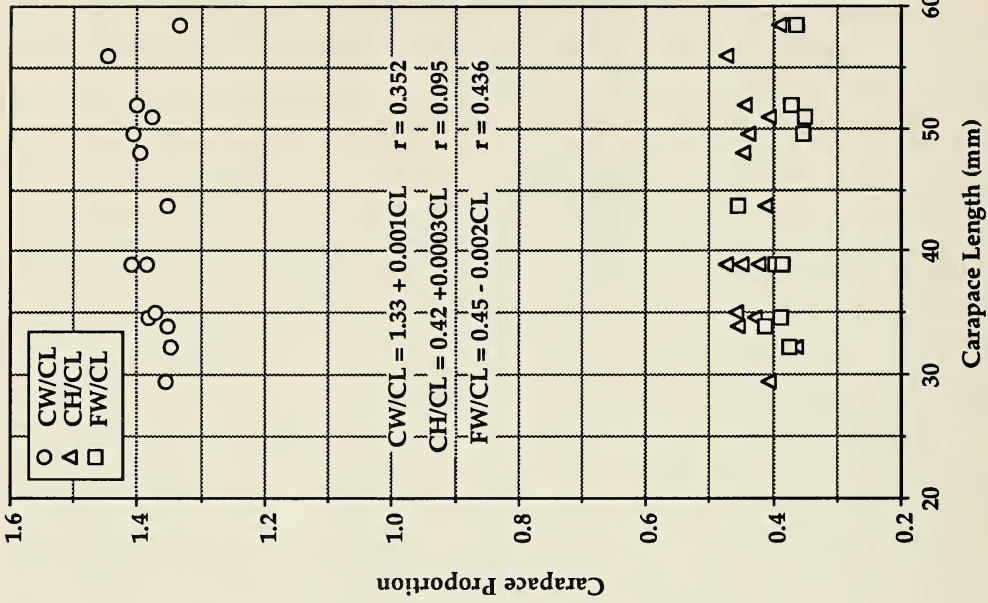
tified here as *Liberonautes latidactylus* (De Man, 1903). There are, therefore, no confirmed records of *S. chavanesii* in any country in West Africa (i.e., from Senegal to Nigeria).

Remarks.—Bott (1955) established the genus *Sudanonautes* (type species by original designation, *Thelphusa africana* A. Milne-Edwards, 1869), and recognized two subgenera, *Sudanonautes* s.s., and *Convexonautes* Bott, 1955 (type species by original designation, *Thelphusa aubryi* H. Milne-Edwards, 1853). *Sudanonautes chavanesii* was one of three subspecies of *Sudanonautes* (*Sudanonautes*) *africanus*, viz. *S. (S.) a. africanus* (A. Milne-Edwards, 1869), *S. (S.) a. chaperi* (A. Milne-Edwards, 1887), and *S. (S.) a. chavanesii* (A. Milne-Edwards, 1886) recognized by Bott (1955, 1959) and Monod (1977, 1980). Cumberlidge (1985) subsequently referred *S. (S.) a. chaperi* to the genus *Liberonautes* Bott, 1955. Data presented here indicate that *Sudanonautes africanus chavanesii* (A. Milne-Edwards, 1886) should also be regarded as a valid species.

Identification of *S. chavanesii* depends on considering the characters of gonopod 1 of *S. chavanesii* (Fig. 2d-f) in conjunction with other characters of the carapace (Fig. 1a-b), sternum (Fig. 1c), chelipeds (Fig. 1e-h), and mandibles (Fig. 2a-b). *Sudanonautes chavanesii* is most likely to be confused with other large species occurring in the rain forests of Central Africa such as *S. africanus*, *S. faradjensis* (Rathbun, 1921), and *S. aubryi* (A. Milne-Edwards, 1853), all of which possess a gonopod 1 with a similar shaped terminal segment: slim, tapering, and curving outward.

Sudanonautes chavanesii can be distinguished from *S. africanus* by the position of the postfrontal crest and the shape of the epibranchial teeth. In *S. chavanesii* the lateral ends of the postfrontal crest curve sharply backward before meeting the epibranchial teeth which are set back posterior to the mid groove of the crest (Fig. 1a),

b.



a.

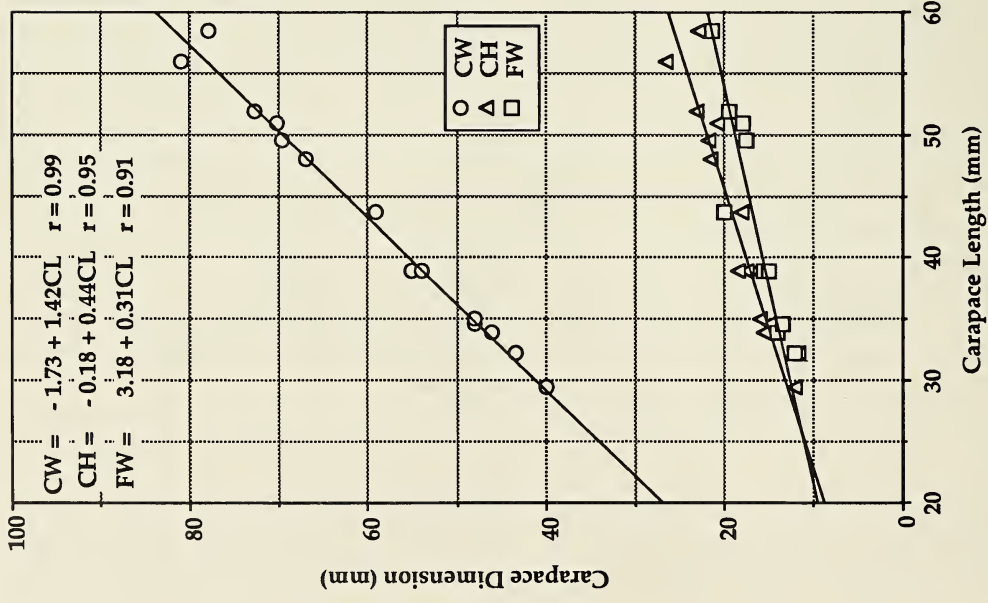


Fig. 3. Comparisons of 14 specimens of *Sudano-nautes chavanesii* (A. Milne-Edwards, 1886). a, dimensions of the carapace (CW, CH, FW) compared to body size (CL); r values (CW, CH at $df = 9$, FW at $df = 9$) indicate a highly significant correlation ($P < 0.001$) between size classes. b, relative proportions of carapace width (CW/CL), carapace height (CH/CL), and front width (FW/CL), compared to body size (CL); r values (CW, CH at $df = 13$, FW at $df = 9$) indicate no significant correlation ($P > 0.05$) between size classes.

whereas in *S. africanus* the lateral ends of the crest curve forward to meet the epibranchial teeth in line with the mid groove of the crest. In *S. chavanesii* the epibranchial tooth is large, sharp, and pointed outward, and the distance between the epibranchial tooth and intermediate tooth is twice the distance between the intermediate and exo-orbital teeth (Fig. 1a, b). In *S. africanus* the epibranchial tooth is small, blunt, pointed forward, and positioned in line with the mid groove of the crest, so that the distance between the epibranchial tooth and intermediate tooth is the same as the distance between the intermediate and exo-orbital teeth. Finally, in *S. chavanesii* the vertical suture on the flank forms a y-shaped depression beneath the intermediate tooth (Fig. 1b), whereas in *S. africanus* the vertical suture on the flank is simple.

Sudanonautes chavanesii can be distinguished from *S. faradjensis* by examination of the anterolateral margin behind the epibranchial tooth: that of *S. chavanesii* is smooth, whereas in *S. faradjensis* there is a row of sharp teeth. In addition, the dactylus of the major cheliped of *S. chavanesii* is arched, forming a single oval interspace when closed, whereas that of *S. faradjensis* is straight, not arched, and forms two interspaces when closed.

Sudanonautes chavanesii can be distinguished from *S. aubryi* by examination of the carapace: that of *S. chavanesii* is significantly flatter ($P < 0.001$) than that of *S. aubryi* (CH/CL *S. chavanesii* = 0.41, *S. aubryi* = 0.52), and has patches of raised blisters, while that of *S. aubryi* is completely smooth. The postfrontal crest of *S. chavanesii* meets the anterolateral margin at the epibranchial tooth, whereas that of *S. aubryi* meets the anterolateral margin behind the epibranchial tooth. In addition, the dactylus of the major cheliped of *S. chavanesii* is arched, with large, fused teeth (Fig. 1e); these features are lacking in *S. aubryi*.

Finally, there is a small flap on the mandibular palp at the junction between the two

segments (Fig. 2a–b) of *S. chavanesii* which is not present in *S. africanus*, *S. faradjensis* and *S. aubryi*.

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